Evaluation of Brown Spot Needle Blight Inoculum Density

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ABSTRACT

This summary is to make a record of an evaluation of brown spot needle blight inoculum density conducted at the Bent Creek, North Carolina Disease Screening Center. The evaluation was carried out during the period November 1976 to August 1977. Results of the evaluation were inconclusive, mainly due to lack of good infection of the longleaf pine seedlings and variability of data. No more resistance screening will be done on brown spot until new controlled temperature greenhouses are constructed. This will be several years in the future.

INTRODUCTION

Artificially inoculating longleaf pine seedlings with the brown spot needle blight organism Scirrhia acicola (Dearn.) Siggers has been quite difficult in the past. Kais 2/ has been successful in finding a method for good needle infection. This is done by covering seedlings with plastic bags before and after inoculation. Since a brown spot resistance screening method was ready for operational use, the Bent Creek screening center initiated a pilot inoculum density evaluation in July 1975. The evaluation was not successful since little or no needle infection occurred on any of the longleaf or scotch pine seedlings. It was thought that the summer temperatures, which were quite high in the greenhouse, were lethal to the spores on the seedlings in the plastic bags.

Another evaluation was conducted in February 1976. There were 12 different inoculation methods evaluated in 2 runs. The plastic bag method was also included. Again needle infection was not very successful, although the plastic bag method was the only one that showed some success. Infection was average, but not as good as that obtained in the Gulfport, Mississippi greenhouse by Mr. Al Kais.

The third evaluation to determine the optimum inoculum density was conducted in March, 1977, and is being summarized in this report.

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2/ Kais, A.G. 1975. Environmental factors affecting brown spot infection on longleaf pine. Phytopathology 65:1389-1392.

At Bent Creek, there have been several technical problems associated with the preparation of inoculum, evaluation procedures, and the lack of controlled temperature greenhouses. Gulfport has been able to show good brown spot infection on longleaf pine seedlings while Bent Creek has not. The reasons for this must be determined before any more brown spot evaluations can be done at Bent Creek.

METHODS AND MATERIALS

The work plan called for inoculum densities in the following amounts: spores per milliliter 100 M; 200 M; 400 M; 800 M; 1,600 M, control (no treatment). Five seed lots and their relative susceptibility were to be screened as follows: Wash. 1-269 (resistant); Wash 1-251 (resistant); Abraham X wind (intermediate); Mississippi mix (susceptible); Texas mix (susceptible). There were to be 4 trays of 10 seedlings each to be run twice (A run and B run), the B run to be made 2 weeks after the A run. Five inoculum sources with spores mixed in equal amounts were to be used as inoculum. Inoculum sources used were L-16, L-18, L-19, M-4, M-10, M-12. Each tray was to receive 10 ml of the mixed spore suspension.

The longleaf pine seed were planted on November 24, 1976 for the A run and December 8, 1976 for the B run. The A run was inoculated on March 14, 1977 and the B run inoculated 2 weeks later. Data was taken on all seedlings August 1 - 4, 1977. The inoculation method used was the covered plastic bag as developed by Mr. Al Kais. Three days before inoculation, needles were gathered together with rubber bands, plant stakes inserted in each tray, which was watered and covered with plastic bags. Plastic bags were removed for inoculation and then replaced over the trays for nine days. The bags were permanently removed after nine days.

A number of problems arose in the execution of the evaluation. There were not enough spores produced per Petri plate as was expected and there was a shortage of inoculum for both runs. Consequently, the A run contained spore concentrations of 100 M, 200 M, 400 M, 800 M, and 1000 M. The B run contained 170 M, 350 M, 600 M. Spore germination was 50 percent after 96 hours. Problems also arose in having enough seedlings for each seed lot for each run. Therefore, there were missing seed lot replicates for each inoculum density. On the day of inoculation the weather turned warm and the temperatures in the greenhouse were quite high (80° - 90° F). Difficulty was also encountered with the Coulter Counter in counting spore numbers at the high inoculum densities.

RESULTS

Table 1 gives the percent infection of trees and needles artificially inoculated with brown spot needle blight. The two resistant seed lots Wash. 1-251 and Wash. 1-296 which were supposedly highly resistant longleaf pine seed lots (3 percent and 5 percent infection from previous tests in Gulfport, Miss.) were susceptible, especially Wash. 1-251. Since there was no replication of the same inoculum densities in 2 runs and all the seed lots were not included for each inoculum density, results could not be statistically analyzed. In addition, the overall infection rate per seedling and per tray was very low and highly variable. The high temperatures could partially explain the lack of good needle infection but there were other technical problem areas which occurred. No more work will be done on brown spot needle blight until a controlled temperature greenhouse is constructed. Results, therefore, are inconclusive.

Table 1. Percent infection of trees and needles artificially inoculated with brown spot needle blight.

Spore Concentration	Seed Lot									
M/ml	Wash. 1-251		Wash. 1-296		Abe X wind		Mississippi mix		Texas mix	
	Trees inf. %	Needles inf. %	Trees inf. %	Needles inf. %	Trees inf. %	Needles inf. %	Trees inf. %	Needles inf. %	Trees inf. %	Needles inf. %
100+	24	1.5	--	--	7	1.0	23	2.4	33	1.6
170*	16	1.5	31	1.4	17	1.0	12	1.3	6	1.7
200+	46	1.9	26	1.8	25	1.3	48	1.6	27	2.1
350*	0	0	19	1.0	0	0	13	2.0	0	0
400+	82	3.6	--	--	39	2.5	45	2.6	26	1.5
600*	17	1.3	29	1.5	7	1.0	12	1.3	17	1.0
800+	75	3.4	--	--	--	--	62	4.0	33	1.6
1000+	--	--	--	--	--	--	71	2.8	14	1.7
Water only	0	0	0	0	0	0	0	0	0	0

+ A run
* B run